CS489 Report: Flute Synthesis

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Contents

Introduction

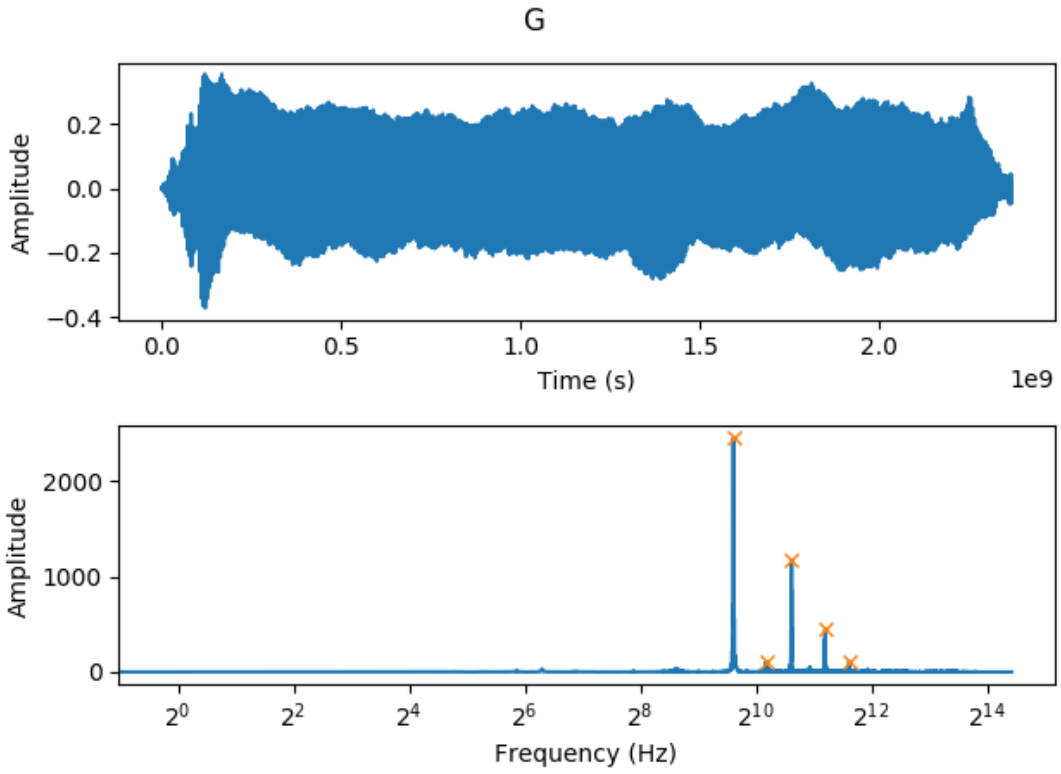
Background

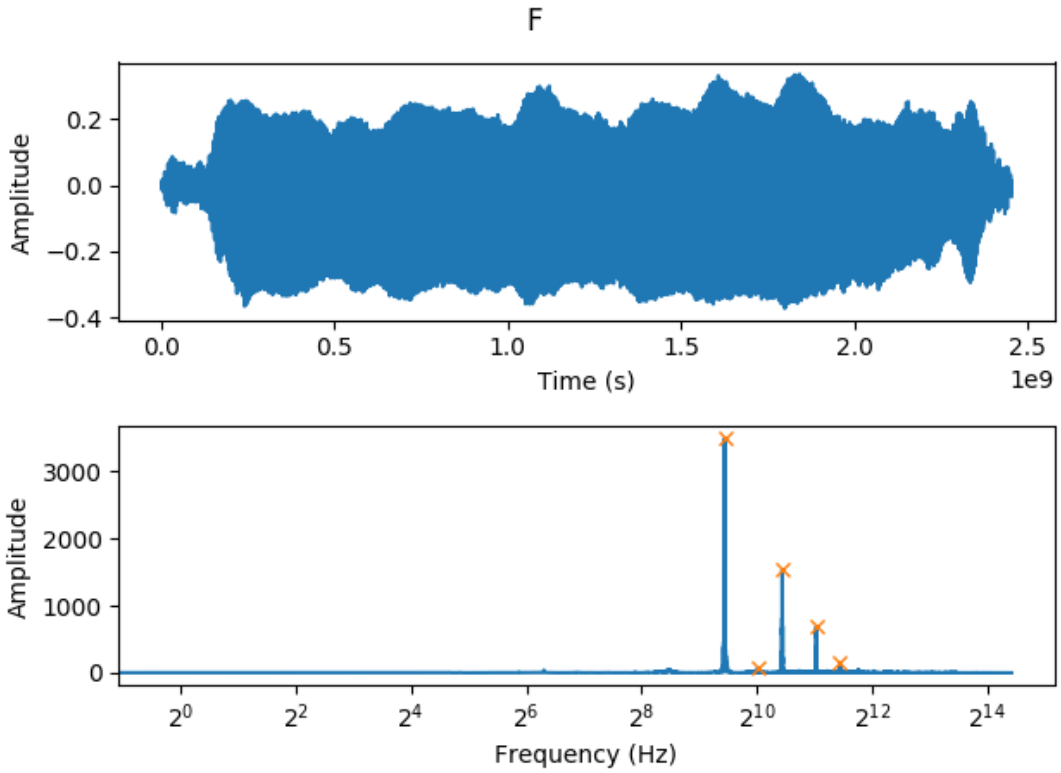
Methodology

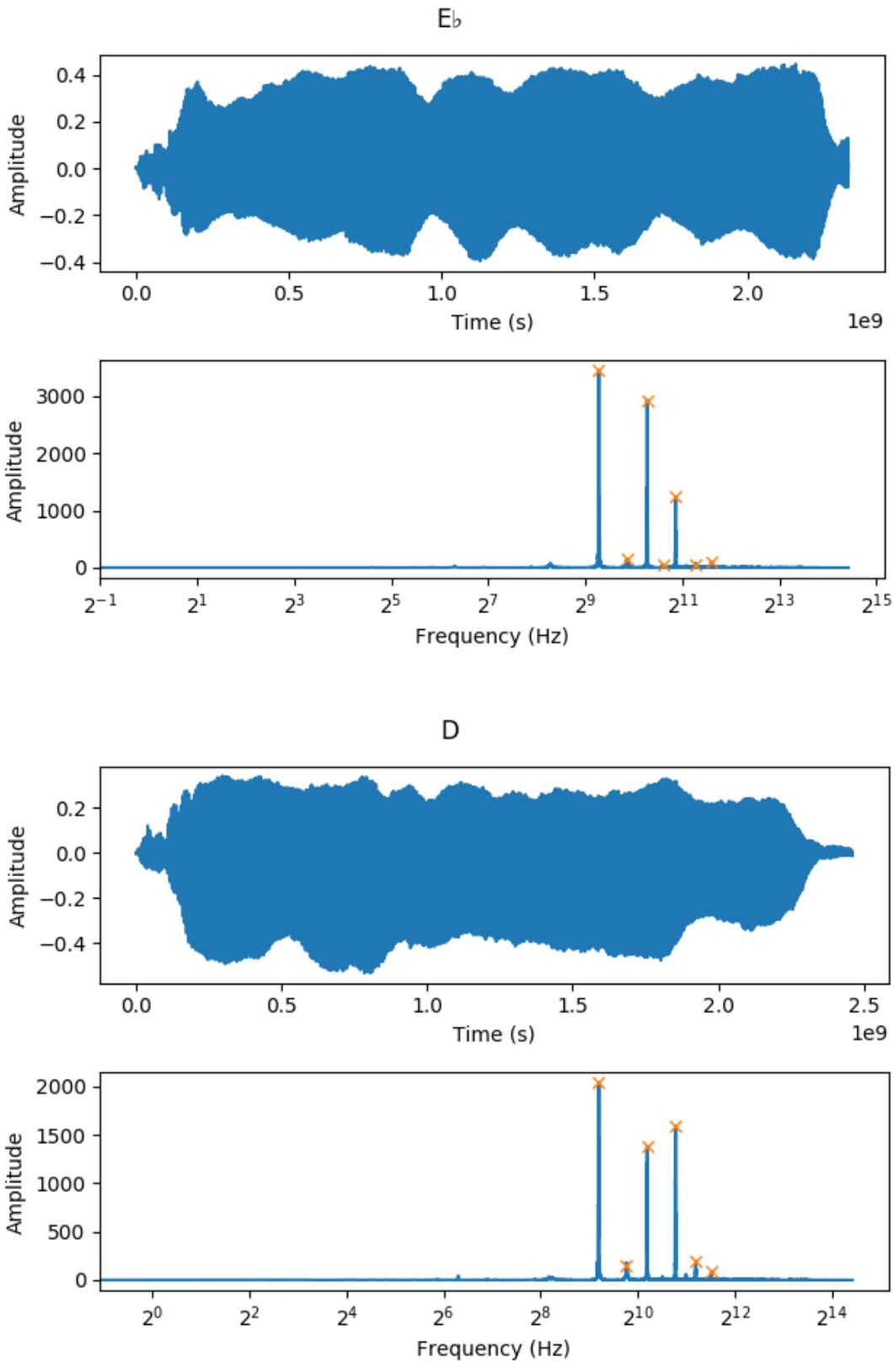
Picking oscillators

In 2018, I recorded a song [1] that featured recordings of myself playing the flute. I extracted four samples from one flute track in the song where a single note is held for around a second. There are samples for the notes G, F, E♭, and D. I processed each sample to get a sense of the harmonics present in the sound of the flute.

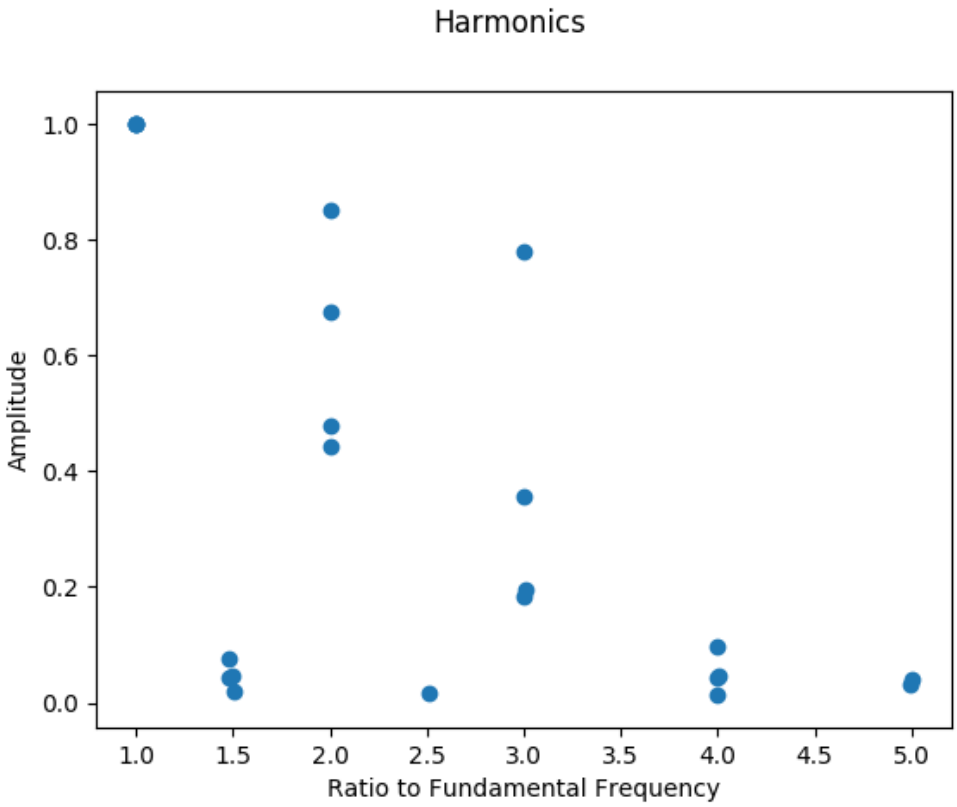
To do this, I ran each sample through a Fast Fourier Transform (FFT). (TODO describe input format.) This converts each sample into the frequency domain, showing, for each frequency contributing to the overall sound, the amplitude of its contribution. The frequency domain is slightly noisy due to the background noise in the recording and the shaky tuning of my own playing, so a peak at a given frequency typically also shows some contribution to the surrounding frequencies. I ran the FFT results through a peak finding algorithm to come up with the frequency and amplitude of each peak, each marked with an X in the figures below.


G
Amplitude
0.2
0.0
−0.2
−0.4
0.0
0.5
1.0
1.5
2.0
Time (s)
1e9
Amplitude
2000
1000
0
2^0
2^2
2^4
2^6
2^8
2^{10}
2^{12}
2^{14}
Frequency (Hz)


F
Amplitude
0.2
0.0
−0.2
−0.4
0.0
0.5
1.0
1.5
2.0
2.5
Time (s)
1e9
Amplitude
3000
2000
1000
0
2^0
2^2
2^4
2^6
2^8
2^{10}
2^{12}
2^{14}
Frequency (Hz)



For each peak found, I graphed its amplitude relative to its distance from the largest peak, which I consider to be the fundamental frequency.



Time variance

Results

References

[1] D. Pagurek, "Throw the dice." 2018 [Online]. Available: https://soundcloud.com/davidpvm/throw-the-dice